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# Is the Islamic Banking Sector Effective on the Volume of Industrial Production? Empirical Evidence from Turkiye Compared to Conventional Banking

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**ABSTRACT**

The objective of the study is to examine the possible impact of Islamic banks (IBs) on industrial production capacity in comparison with the conventional banking sector. The study is based on the case of Turkey and the impact of trade credits provided by the conventional and IB sectors on selected industrial production volume indices between 2005Q1 and 2022Q4 is analyzed using the Fourier Quantile Granger Causality Test. The results of the empirical analysis clearly reveal that there is a mutual causality relationship between the conventional banking sector and the sectoral indices analyzed in the study. When the situation in terms of Islamic banking is evaluated, it is determined that its power to influence the real sector has not yet been established. However, there is a causality from the real sectors to Islamic banking and the relevant real sectors serve the development of the Islamic banking sector. The results of the study show that the field of IB in Turkey is still in its infancy and has not yet had the expected impact. The findings of the study also suggest that real sector support is needed in the early stages of IB development. As seen in the literature reviewed in this study, the developing field of IB is likely to have a positive impact on the volume of industrial production in the future. For all these

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reasons, it is recommended that policymakers make the necessary arrangements for the development of the IB field.


## ملخص

تهدف هذه الدراسة إلى فحص التأثير المحتمل للبنوك الإسلامية على القدرة الإنتاجية الصناعية مقارنة مع القطاع المصرفي التقليدي. تستند الدراسة إلى حالة تركيا وتأثير الائتمانات التجارية المقدمة من القطاعين المصرفيين التقليدي والإسلامي على مؤشرات حجم الإنتاج الصناعي المختارة خلال الفترة من الربع الأول لعام 2005 حتى الربع الرابع لعام 2022، وذلك باستخدام اختبار السببية بطريقة فوريه (Fourier Quantile Granger Causality Test). وتكشف نتائج التحليل التجريبي بشكل واضح عن وجود علاقة سببية متبادلة بين القطاع المصرفي التقليدي والمؤشرات القطاعية التي تم تحليلها في الدراسة. بينما عندما يتم تقييم الوضع في حالة القطاع المصرفي الإسلامي، يتبين أن قدرته على التأثير في القطاع الحقيقي لم يتم إثباتها بعد. ومع ذلك، تظهر علاقة سببية من القطاعات الحقيقية إلى المصرفية الإسلامية والقطاعات الحقيقية ذات الصلة، حيث تسهم هذه القطاعات الحقيقية في تطوير القطاع المصرفي الإسلامي. وتوضح نتائج الدراسة أن مجال البنوك الإسلامية في تركيا لا يزال في مراحله الأولى ولم يحقق بعد التأثير المتوقع. ولكما تشير النتائج إلى ضرورة دعم القطاع الحقيقي في المراحل المبكرة من تطوير البنوك الإسلامية. ولكما هو واضح في الأدبيات التي تمت مراجعتها في هذه الدراسة، فإن المجال المتنامي للبنوك الإسلامية قد يكون له تأثير إيجابي على حجم الإنتاج الصناعي في المستقبل. لجميع هذه الأسباب، يوصى بأن يتخذ صانعو السياسات الترتيبات اللازمة لتطوير مجال البنوك الإسلامية.



## RÉSUMÉ

L'objectif de cette étude est d'examiner l'impact possible des banques islamiques sur la capacité de production industrielle par rapport au secteur bancaire conventionnel. L'étude est basée sur le cas de la Türkiye et l'impact des crédits commerciaux fournis par les secteurs conventionnels et IB sur les indices de volume de production industrielle sélectionnés entre 2005Q1 et 2022Q4 est analysé en utilisant le test de causalité de Fourier Quantile Granger. Les résultats de l'analyse empirique révèlent clairement qu'il existe une relation de

causalité mutuelle entre le secteur bancaire conventionnel et les indices sectoriels analysés dans l'étude. Lorsque l'on évalue la situation du secteur bancaire islamique, on constate que son pouvoir d'influence sur le secteur réel n'a pas encore été établi. Cependant, il existe une causalité entre les secteurs réels et la banque islamique et les secteurs réels concernés servent le développement du secteur bancaire islamique. Les résultats de l'étude montrent que le domaine de l'IB en Türkiye en est encore à ses débuts et n'a pas encore eu l'impact escompté. Les résultats de l'étude suggèrent également que le soutien du secteur réel est nécessaire aux premiers stades du développement de l'IB. Comme le montre la littérature analysée dans cette étude, le développement du domaine de l'IB est susceptible d'avoir un impact positif sur le volume de la production industrielle à l'avenir. Pour toutes ces raisons, il est recommandé aux décideurs politiques de prendre les dispositions nécessaires au développement du domaine de l'IB.

**Keywords**: Islamic banking; Participation banking; Industrial output; Financial development; Quantile Granger Causality Test

**JEL Classification:** G21, D24, O11

## 1. Introduction

The idea that finance can serve as an engine of growth has been widely discussed and has garnered significant attention in numerous studies since Schumpeter (1911; 2003) introduced the concept. The initial study that brought forth this idea received considerable interest, and subsequent research (Gurley & Shaw, 1955; McKinnon, 1973; Shaw, 1973; et al.) confirmed its impact. Subsequent studies have examined the direction of this effect and thoroughly discussed the topic from various empirical angles (Patrick, 1966; Goldsmith, 1969; Jung, 1986; et al.). The banking industry holds a substantial share within the financial sector and requires separate consideration regarding its impact on the discussed relationships. Extensive research has addressed its influence on economic growth (Levine, 1998; Rousseau & Wachtel, 2000; Arestis et al., 2001; Beck & Levine, 2004; Cave et al., 2020; Bibi, 2022; et al.). As demonstrated in these studies, the development of the banking sector is among the most crucial variables associated with growth performance across countries. Additionally, the Islamic banking sector, which has experienced significant growth worldwide since the 1960s, presents a separate area for evaluation. It is essential to assess the contributions of these emerging Islamic banking activities to economic growth. Early studies on the Islamic banking sector in economic literature initially yielded negative

results regarding its impact on economic growth compared to theoretical studies (Goaied & Sassi, 2010). However, as the Islamic finance sector has developed over time, numerous studies have demonstrated the positive effects of Islamic banking on economic growth, parallel to the conventional banking sector (Furqani & Mulyany, 2009; Abduh & Azmi Omar, 2012; Abduh et al., 2012; Kassim, 2016; Caporale & Helmi, 2018; Mensi et al., 2020; Hunjra et al., 2022).

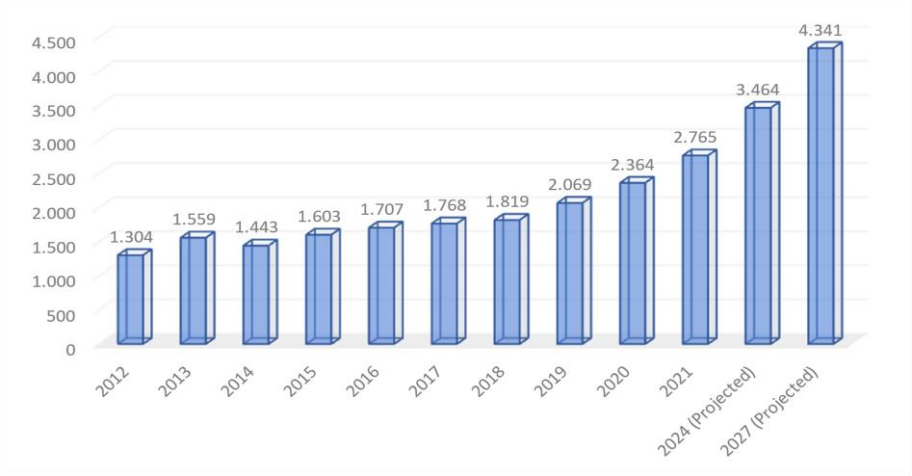
Islamic banks are financial institutions that operate according to Islamic principles and regulations, aiming to maximize profits or the market value of their organizations. They face the challenge of operating within the competitive landscape of conventional banks and other financial institutions while adhering to Islamic restrictions. One of the most significant constraints is the prohibition of interest, which is a fundamental trade restriction in Islam. Since the conventional financial system is based on interest, this prohibition acts as both a limitation and a catalyst for the emergence of Islamic banking.

Islamic banking originated in Egypt during the 1960s on a small scale to address the deficiencies of the general banking system in meeting the needs of religious individuals (Kazak & Okka, 2022). Since then, it has witnessed remarkable growth. While the development of Islamic banking is not exclusive to specific countries, it has primarily occurred in nations with larger Muslim populations (Imam & Kpodar, 2013). Currently, Islamic banking holds the largest share of Islamic financial assets, comprising approximately 70% (Refinitiv, 2022). As of the end of 2021, the global value of Islamic assets amounted to approximately US$4 trillion, and it is projected to reach around US$6 trillion by the end of 2026.

S&P Global Ratings reports that the Islamic finance industry will exceed US$3 trillion by 2022, excluding Iran and some countries (Damak et al., 2023). Within Islamic financial assets, the Islamic banking sector had reached a volume of US$2.8 trillion by the end of 2021 (Refinitiv, 2022). S&P Global Ratings also reports that the Islamic banking sector approached US$2 trillion by the end of 2022, based on the countries they evaluated (Damak et al., 2023). Islamic banking has spread beyond Islamic countries and reached all corners of the world, from East to West, Indonesia to Turkiye, Asia, and Africa to Europe and the USA. The Islamic Financial Development Indicator (IFDI) currently assesses data from 136 countries. As of the end of 2021, the evaluation includes 566

Islamic banks (Refinitiv, 2022). The development and future outlook of the Islamic banking sector over the years are depicted in Figure 1.

**Figure 1:** Development of the Islamic banking sector (US$ Billion)




Source: Refinitiv (2022). The authors have created future projections based on past data and literature.

Considering the development of the total assets of the Islamic banking sector and its position in the total banking volume in the case of Turkiye, the situation as of April 2023 is as shown in Figure 2.

**Figure 2:** The development of the Turkish banking sector (total and participation; total assets; US$ million)


Source: Turkish Banking Regulation and Supervision Agency (BRSA-BDDK; https://www.bddk.org.tr)

Islamic banking, as mentioned above, operates in line with the same objective as traditional banking: to provide and allocate funds needed by the markets. However, it differs from traditional banking regarding the methods and techniques used to achieve this objective. The traditional banking sector primarily operates based on principal plus interest in its assets and liabilities. In this context, the time value of money exists, and interest, which can be considered the rental return of time, is at the core of the interest-based system. In contrast, in the Islamic financial system, the time value of money is not considered on its own. Money gains the ability to generate income only when it is combined with an asset or service (Okka & Kazak, 2021).

Islamic banks primarily utilize a "labor + capital" system called mudarabah when providing funds. In the mechanism of transferring funds to those in need, they employ three fundamental structures: partnership-based instruments (mudarabah and musharakah), leasing-based instruments (Ijarah), and trade-based instruments (murabahah, salam, istisna). These differences between traditional and Islamic banking systems can have different implications for markets and the economy. Industrialization is a significant component of economic growth and development, making it crucial to establish a link with finance (Nucci et

al., 2005; Badia & Slootmaekers, 2009). However, the relationship between financial development and industrialization often needs to be noticed and receives relatively less attention from researchers (Chen & Guariglia, 2013). While numerous studies in the literature compare traditional banks and Islamic banks from various perspectives, relatively few studies specifically focus on the impact of Islamic banks on production and industrial sectors. Therefore, this study fills a significant gap in the literature by comparatively investigating the effects of traditional and Islamic banks on industrial production indices and evaluating causality in stages using the Quantile Fourier Granger Causality Test.

## 2. Literature Review

Numerous studies have extensively examined the notion that finance plays a crucial role in driving economic growth, which was first introduced by Schumpeter (1911; 2003). The initial work on this concept garnered significant interest, and subsequent studies by Gurley & Shaw (1955), McKinnon (1973), and (Shaw, 1973) confirmed its impact. Further research explored the direction of this relationship, and numerous empirical studies thoroughly explored the subject from various perspectives, as demonstrated by the works of Patrick (1966), (Goldsmith, 1969), and (Jung, 1986). As time passed, a substantial body of literature emerged, consisting of numerous empirical studies investigating the relationship between finance and economic growth. These studies presented diverse assessments, suggesting unidirectional causality from finance to economic growth in some cases, reverse causality in others, and occasionally a bidirectional relationship that changes over time, as evidenced by the works of King & Levine (1993), Hansson & Jonung (1997), Levine (1998), Benczúr et al. (2019), Emara & Said (2021), Zhang & Zhou (2021), and Nguyen et al. (2022).

The impact of the banking sector, which is a component of the financial sector, on economic growth has been extensively explored in the literature, similar to the relationship between finance and the economy. Empirical evidence has consistently confirmed the influence of the banking sector on economic growth, as evidenced by the works of Levine (1998), Rousseau & Wachtel (2000), Arestis et al. (2001), Beck & Levine (2004), Christopoulos & Tsionas (2004), Menyah et al. (2014), Balcilar

et al. (2018), Cave et al. (2020), Bibi (2022), Oyadeyi (2023), Kazak (2023) and Murrar et al. (2024).

In our study, we specifically focus on the broader banking industry, examining both the general banking sector and the Islamic banking sector. Drawing from the existing literature on this topic, several noteworthy themes emerge.

The existing literature on Islamic banking primarily focuses on examining the distinctions between conventional banks and Islamic banks concerning credit risk and stability. Scholars such as Elgari (2003), Hanif et al. (2012), Lassoued (2018), Hassan et al. (2019), Chamberlain et al. (2020), Sobarsyah et al. (2020) and, Dibooglu et al. (2022) have conducted numerous studies in this domain. Additionally, some investigations specifically analyze these differences during periods of crisis, as explored by Ghouse et al. (2022), Ashraf et al. (2022), and Boubakri et al. (2023). The findings of many of these studies suggest that Islamic banking exhibits greater resilience than conventional banks when it comes to economic crises, credit risk, and stability. However, certain studies focusing on crisis periods have reached the opposite conclusion, suggesting that the higher cost structure inherent in Islamic banking may make them more vulnerable to crises than conventional banks (Ashraf et al., 2022). Similarly, another group of studies compares Islamic banks' efficiency and financial performance with conventional banks. These studies analyze the two bank categories using various financial indicators and compare their respective strengths (Awan, 2009; Abdul-Majid et al., 2010; Johnes et al., 2014; Bitar et al., 2020; Hidayat et al., 2021; Slimen et al., 2022; et al.).

Another group of studies examines the impact of Islamic and conventional banks on the size of supported firms. These studies demonstrate that Islamic banks are more successful than conventional banks in financing Small and Medium-sized Enterprises (SMEs) due to their greater focus on this sector (Huda, 2012; Disli et al., 2023; et al.). Islamic banks also provide significant support in the form of microfinance. Several studies have shown that Islamic banks enhance economic well-being through microfinance and other development-supportive funding activities (Muhammad, 2012; Alam et al., 2015; Santoso & Ahmad, 2016; Razak & Asutay, 2022; et al.). These Islamic banking activities align with the fundamental goal of Islamic economics, which aims to eliminate poverty

and ensure social justice (Khan, 1986). In this regard, the Islamic finance and banking system stands out as a more efficient and stable system that generates more effective policies than its traditional counterparts (Darrat, 1988; Hassan & Aldayel, 1998). Another group of studies in this context are the studies on the sustainability of Islamic banking, which stands out with some positive qualities, and the convergence of countries (Hassan et al., 2023; Kazak et al., 2024).

A significant body of research focuses on investigating the macroeconomic implications of Islamic banks and their contributions to economic growth. Numerous studies have consistently found that the growth and development of Islamic banking have positive effects on macroeconomic efficiency. This has been demonstrated in studies conducted by Abduh & Azmi Omar (2012), Gheeraert & Weill (2015), Imam & Kpodar (2016), Lebdaoui & Wild (2016), Boukhatem & Moussa (2018), Mensi et al. (2020), Kazak & Okka (2022), Kamarudin & Kassim (2022), Hunjra et al. (2022).

Within the literature, there is a scarcity of comparative studies that examine the influence of loans provided by Islamic and conventional banks on industrial production indices. Existing research on this topic primarily focuses on indirect effects, exploring the macroeconomic impacts, contributions to economic growth, and effects on foreign trade. Studies that approach this topic indirectly include the works of Al-Suwaidi (1991), Ergeç & Kaytancı (2021), Hawi (2016), İçellioğlu & Öztürk (2019). However, there are limited studies specifically dedicated to investigating the effects of Islamic banks on production and the industrial sectors. We present some of these studies below.

Rafay & Farid (2017) conducted a study in Pakistan to assess the impact of Islamic banks on the Large-Scale Manufacturing Index (LSMI). Their analysis revealed a significant positive and dynamic long-term bidirectional causal relationship between Islamic banking and industrial activity. Yüksel & Canöz (2017) investigated the causal relationship between the growth rates of total credit amounts provided by Islamic banks and the industrial production index in Turkiye. However, their results indicated that Islamic bank loans do not have a significant impact on the development of the Turkish economy and industry. Muttaqin (2018) examined the influence of Islamic banking-sourced financing on the real GDP across ten economic sectors. The study identified a long-

term bidirectional relationship between Islamic bank financing and seven of the economic sectors. Nursyamsiah (2018) explored the relationship between Islamic banking financing and the industrial production index (IPI), as well as international trade and other macroeconomic variables. The study concluded that Islamic banking is influenced by the IPI and also affects international trade volume. Setiawan (2019) found that Islamic banks contribute to increasing economic activity and employment, specifically in seven sectors of the economy. Chazi et al. (2020) analyzed the impact of Islamic banking on sectoral growth in 14 countries with dual banking systems and 28 sectors. The study determined that Islamic banking has a positive influence on sectoral growth in both absolute and relative dimensions. Bougatef et al. (2020) investigated the relationship between Islamic banking and industrial production. Their research demonstrated that financing obtained from Islamic banks significantly increases industrial production in both the short and long term. Ergeç & Selçuk (2020) examined the causal relationship between variables representing the Islamic and conventional banking sectors and eight industrial production indices. The study concluded that there are fewer causal relationships between industrial production and Islamic banking compared to conventional banking, with most of the relationships pointing from the industry towards banking. Tekin (2021) analyzed the cointegration and causal relationships between the financing provided by Islamic and conventional banks to the real sector and industrial production variables. According to the results of the Johansen cointegration test, industrial production and the financing series provided by both conventional and Islamic banks to the real sector move together in the long run. Trianto & Masrizal (2021) examined the impact of Islamic finance on the real sector in Indonesia. As a result of the econometric analysis, it was found that Islamic bank financing has a positive effect on real sector growth in both the long and short run. Gani & Bahari (2021), on the other hand, found no significant relationship in the short run, but in the long run, Islamic finance has an impact on the real sector and contributes to the growth of the Malaysian economy. Studies conducted in the 2021-2023 period mainly focus on the impact of Islamic finance on GDP and other economic growth indicators (Ledhem & Mekidiche, 2021; Naz & Gulzar, 2022; Sakinah et al., 2022; Shawtari et al., 2023). The number of studies specifically addressing the real sector is quite limited, and among these studies, the studies by Aliakbari et al. (2022) and Kazak et al. (2023) are quite remarkable. In the study by Aliakbari et al. (2022), the impact of some selected Islamic financial instruments on three

economic sectors, namely industry, agriculture and services, is analyzed. The results of the analysis show that Islamic finance has a significant impact on the economic growth of the agricultural and industrial sectors, while it has no significant impact on the services sector. In 2023, Kazak et al. (2023) conducted another important study on the real sector. The study analyzed the impact of conventional and Islamic banking on three selected real sectors in the case of Turkiye. The results of the empirical analysis show that both banking areas have a time-varying impact on the real sector, but the impact of Islamic banking on the real sector is very weak. When all these studies are evaluated, it is clear that there is a need for more studies in the literature that address the real sector details. Since Islamic finance is an emerging field, its impact on micro and macro-economic indicators is of course important and studies on this subject serve the development of Islamic finance. However, in addition to general indicators, studies that address the indicators of enterprises and the real sector, which are important elements of the economic structure, are very important and necessary in terms of revealing the picture of the related field more clearly. This study fills an important gap in the literature in terms of addressing this gap.

The next stages of the study consist of Methodology, Data and Descriptive Statistics and finally Conclusion sections.

## 3. Methodology

In this study, we employ the Bootstrap-Fourier Quantile Granger Causality Test (BFGC-Q) to examine causal relationships between variables. The BFGC-Q test is chosen because it offers a more comprehensive and flexible approach compared to classical Fourier-Toda-Yamamoto causality tests. The latter tests do not provide sufficient information regarding non-linear causality and tail-causality relationships. Cheng et al. (2021) applied this method and found it to be effective in evaluating causality relationships (Cheng et al., 2021; Shahzad & Fareed, 2023). Unlike traditional Granger causality tests, this test allows for a more in-depth analysis of causal dynamics by capturing nonlinear and asymmetric causal relationships in different quantiles. Moreover, the inclusion of Fourier functions in the analysis allows the test to take into account structural breaks and cyclical fluctuations in the data, further enhancing the reliability of causality detection. These features make the use of the Bootstrap-Fourier Quantile Granger Causality Test

(BFGC-Q) an important tool for analyzing an important area such as Islamic banking. This analysis is preferred in this study as it is an effective tool in uncovering complex causal interactions that standard methods fail to detect.

Before conducting econometric analysis, it is essential to test the stationarity of the variables using unit root tests. In this study, we utilize the Fractional Frequency Fourier Augmented Dickey-Fuller (ADF) Unit Root Test, which is one of the most recent unit root tests available. The ADF test builds upon the original equation proposed by Dickey & Fuller (1979) and extends it with a constant term and trend effect, as specified in Equation 1.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \lambda Y_{t-1} + \mu t \tag{1}$$

Equation 1 was expanded to obtain Equations 2, 3, and 4 by adding Fourier functions proposed by Enders & Lee (2012).

$$Y_t = \alpha(t) + PY_{t-1} + Y_t + \varepsilon_t \tag{2}$$

$$\alpha(t) = \alpha 0 + \sum \alpha_k \sin(2\pi kt/T) + \sum_{k=1}^{n} \beta \cos(2\pi kt/T); n \leq T/2 \tag{3}$$

$$\Delta yt = \rho y_{t-1} + c_1 + c_2 t + c_3 \sin\left(\frac{2\pi kt}{T}\right) + c_4 \cos\left(\frac{2\pi kt}{T}\right) + e_t \tag{4}$$

By incorporating fractional and frequency components, Bozoklu et al. (2020) derived Equations 5 and 6, which constitute the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root test, as an extension of the Augmented Dickey-Fuller Unit Root test.

$$\Delta Y_t = \delta_0 + \delta_1 \sin\left(\frac{2\pi kt}{T}\right) + \delta_2 \cos\left(\frac{2\pi kt}{T}\right) + \delta_3 Y_{t-1} + \sum_{i=1}^{P} \alpha i \Delta Y t - i + v_t \tag{5}$$

$$Y^{*}t = \alpha_0 1_t^{*} + \beta_0 t_t^{*} + \lambda_1 \sin_{1,t}^{*} + \lambda_2 \cos_{1,t}^{*} + \mu_t \tag{6}$$

Following the application of the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root test using these formulations, the Fourier Quantile Granger Causality test (BFGC-Q) will be conducted. This test utilizes Equations 7, 8, 9, and 10, based on the Nazlioglu et al. (2016) study, as described by Cheng et al. (2021).

$$d(t) = \gamma_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) \tag{7}$$

$$\begin{aligned} Y_{\mathrm{t}} = \gamma_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \sum_{i=1}^{p+h} \Theta_i \mathrm{Y}_{t-1} \\ + \sum_{j=1}^{m} \sum_{i=1}^{p+h} \vartheta_{j,i} X_{j,t-i} + \varepsilon_t \end{aligned} \tag{8}$$

$$\begin{aligned} Q_{Y_t}(\tau|\mathrm{Z}) = \gamma_0(\tau) + \gamma_1(\tau) \sin\left(\frac{2\pi k^{*} t}{T}\right) + \gamma_2(\tau) \cos\left(\frac{2\pi k^{*} t}{T}\right) \\ + \sum_{i=1}^{p^{*}+h} \Theta_i(\tau) \mathrm{Y}_{\mathrm{t-i}} + \sum_{i=1}^{p^{*}+h} \vartheta_{j,i}(\tau)\, X_{j,t-i} + \varepsilon_t \end{aligned} \tag{9}$$

The Walt test, which will be employed within the Quantile Fourier Granger Causality test framework, is calculated based on Equation 10.

$$\mathrm{Wald} = \left[ T \left( \left( \tilde{\eta}_j(\tau) \right)' \left( \Omega(\tau) \right)^{-1} \left( \tilde{\eta}_j(\tau) \right) \right) \right] / \tau(1-\tau) \tag{10}$$

With the formulations mentioned earlier, a stationary analysis will be conducted for the variables, followed by an investigation of causality relationships using the Quantile Fourier Granger Causality test. The findings of these investigations will be reported in the econometric application section of the article.

## 4. Data and Descriptive Statistics

To analyze the effects of the banking sector and Islamic banking (participation banking) on credit provision and fund allocation to various

production sectors, the study utilized data from the period between 2005Q1 and 2022Q4 for the following variables: Commercial Loans Granted by the Banking Sector to Businesses, Commercial Fund Transfer by Islamic Banking to Businesses, Intermediate Goods Production Index, Durable Consumer Goods Production Index, Non-Durable Consumer Goods Production Index. All series were transformed using natural logarithms and seasonally adjusted. Table 1 provides abbreviations and source information for these variables.

**Table 1:** Outline of the variables

| Variable | Notation | Source |
|---|---|---|
| Commercial loans granted by the banking sector to businesses | BNK | The Banking Regulation and Supervision Agency of Turkiye (BRSA-BDDK [tr]) |
| Commercial fund transfer by participation banking to businesses | PRTB | |
| Intermediate goods production index | ARM | Turkish Statistical Institute (TURKSTAT-TÜİK [tr]) |
| Durable consumer goods production index | DLT | |
| Non-durable consumer goods production index | DZT | |

The notations in Table 1 are based on open access resources released by the Turkish government. Table 2 displays a set of descriptive statistics for five different variables or datasets (BNK, PRTB, ARM, DLT, DZT). BNK has the highest average value (6.636396), which is considerably larger than all the other datasets. On the other hand, PRTB has the lowest average value (3.774877). Similar to the mean, BNK has the highest median value, indicating that the central tendency of this data set is higher than the others. Meanwhile, PRTB has the lowest median value. BNK also has the highest maximum value and a higher minimum value compared to the other datasets. This indicates a higher overall range for BNK.

The highest standard deviation is observed in PRTB (1.18283), indicating that the data points are spread out over a wider range of values. The lowest standard deviation is seen in DLT (0.264804), indicating a relatively narrow dispersion. Skewness measures the asymmetry of the probability distribution of a real-valued random variable about its mean. Here, DZT shows the highest positive skewness (0.326615), indicating a distribution with a tail on the right (more values to the right of the mean), whereas ARM shows the highest negative skewness (-0.10508), indicating a distribution with a tail on the left (more values to the left of the mean). Kurtosis is a statistical measure used to describe the distribution of

observed data around the mean. It indicates the "tailedness" of the distribution. Here, PRTB shows the highest kurtosis (2.488204), indicating a more "tailed" and peaked distribution than a normal distribution (kurtosis of a normal distribution is 3).

**Table 2.** Descriptive statistics

| | **BNK** | **PRTB** | **ARM** | **DLT** | **DZT** |
|---|---|---|---|---|---|
| Mean | 6.636396 | 3.774877 | 4.517791 | 4.559524 | 4.555912 |
| Median | 6.703192 | 3.917546 | 4.555743 | 4.581011 | 4.538015 |
| Maximum | 8.778317 | 6.274935 | 5.02736 | 5.091502 | 5.103262 |
| Minimum | 4.542857 | 1.422492 | 3.880462 | 4.052449 | 4.128536 |
| Std. Dev. | 1.111696 | 1.18283 | 0.283417 | 0.264804 | 0.273649 |
| Skewness | -0.03108 | -0.00997 | -0.10508 | -0.07296 | 0.326615 |
| Kurtosis | 1.994249 | 2.488204 | 2.102739 | 2.184863 | 2.076901 |
| Jarque-Bera | 3.046198 | 0.786996 | 2.547738 | 2.057224 | 3.836465 |
| Probability | 0.218035 | 0.674693 | 0.279747 | 0.357503 | 0.146866 |
| Sum | 477.8205 | 271.7911 | 325.281 | 328.2858 | 328.0256 |
| Sum Sq. Dev. | 87.74661 | 99.33515 | 5.703073 | 4.978592 | 5.316761 |
| Observation | 72 | 72 | 72 | 72 | 72 |

The Jarque-Bera test in Table 2 is a goodness-of-fit test that shows whether the sample data have skewness and kurtosis that fit the normal distribution. Here, the highest Jarque-Bera value is seen in DZT (3.836465) and the lowest in PRTB (0.786996), indicating that DZT deviates more from normal distribution compared to others based on skewness and kurtosis. BNK has the highest sum and sum of squares, indicating a higher total value and variance within the data. In general, we could conclude that BNK tends to have higher values overall, but the values in PRTB are more varied. The dataset DZT appears to deviate most from the normal distribution based on its Jarque-Bera statistic.

Figures 3 and 4 show the temporal changes of the series of variables together with the Fourier function expansion.

**Figure 3:** Banking (BNK) and Participation Banking (PRTB) Data Series and Fourier Approximations

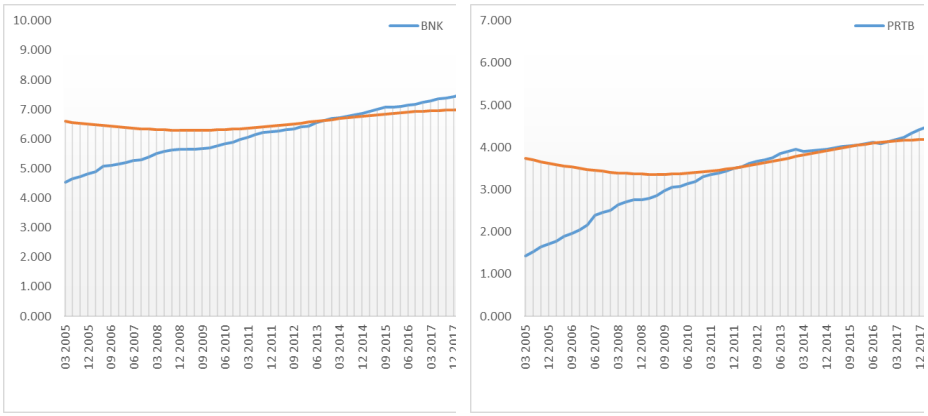
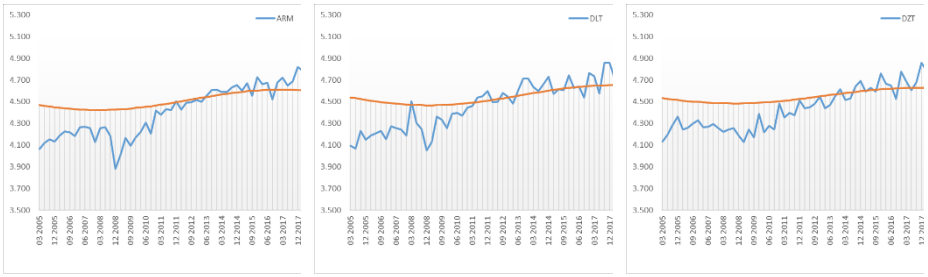



**Figure 4:** Variable Series and Fourier Approximations




## 5. Econometric Application

Before analyzing the relationship between the variables, conducting a unit root test on the variables used in the econometric analysis is necessary. Therefore, the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root Test was applied to the analyzed variables. The statistical values related to this test are provided in Table 3.

**Table 3: Fractional Frequency Fourier Augmented Dickey-Fuller Test Values**

| Variable | k | Min KKT | F Test Statistic | Appropriate Lag Length | FADF Test Statistic | FADF 1% Critical Value | FADF 5% Critical Value | FADF 10% Critical Value |
|---|---|---|---|---|---|---|---|---|
| BNK | 0.1 | 0.118038 | 2.733183 | 7 | -1.41239 | -4.87987 | -4.26469 | -3.95616 |
| D(BNK) | 0.1 | 0.117765 | 2.591123 | 4 | -4.79824 | -4.87987 | -4.26469 | -3.95616 |
| PRTB | 0.9 | 0.169418 | 10.78794 | 4 | -1.768798 | -4.9365 | -4.33798 | -4.03407 |
| D(PRTB) | 0.4 | 0.167451 | 9.984654 | 3 | -5.78825 | -4.88261 | -4.27395 | -3.97253 |
| ARM | 0.3 | 0.425649 | 4.834637 | 4 | -3.1376 | -4.87614 | -4.28045 | -3.97388 |
| D(ARM) | 5 | 0.437713 | 5.096211 | 3 | -4.24314 | -4.21133 | -3.5507 | -3.22669 |
| DLT | 0.1 | 0.623112 | 2.411651 | 3 | -2.10325 | -4.87987 | -4.26469 | -3.95616 |
| D(DLT) | 5 | 0.822917 | 4.869585 | 2 | -10.4604 | -4.21133 | -3.5507 | -3.22669 |
| DZT | 0.2 | 0.428109 | 4.873424 | 5 | -2.70097 | -4.87804 | -4.2659 | -3.96258 |
| D(DZT) | 2.1 | 0.579646 | 8.444328 | 2 | -15.9706 | -4.65415 | -3.99798 | -3.65697 |

According to the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root Test applied at the level values of the variables, the calculated F-statistic values exceed the critical values. This implies that the variables contain unit roots at the level values. However, it is observed that the F-statistic values obtained after taking the differences of the variables in the Fractional Frequency Fourier Augmented Dickey-Fuller Unit Root Test are smaller than the critical values. This suggests that the variables are first-degree stationary.

After determining that the variables are stationary at the same level through the unit root test, the Fourier Quantile Granger Causality Test was applied to identify the causal relationship between the variables. The results of this test are presented in Table 4 and Table 5.

**Table 4:** Fourier Quantile Granger Causality Test Results (Banking Sector)

| Effect | Causality | Quantile | Wald test. | | Causality | Quantile | Wald test. | |
|---|---|---|---|---|---|---|---|---|
| | BNK→ARM | 0.1 | 11.0142 | ** | ARM→BNK | 0.1 | 4.5617 | ** |
| | BNK→ARM | 0.2 | 6.9730 | | ARM→BNK | 0.2 | 3.1755 | * |
| | BNK→ARM | 0.3 | 7.3250 | * | ARM→BNK | 0.3 | 1.7623 | |
| | BNK→ARM | 0.4 | 4.1124 | | ARM→BNK | 0.4 | 1.1258 | |
| (+) | BNK→ARM | 0.5 | 4.1908 | | ARM→BNK | 0.5 | 0.3975 | |
| | BNK→ARM | 0.6 | 7.2550 | | ARM→BNK | 0.6 | 0.2109 | |
| | BNK→ARM | 0.7 | 8.5357 | | ARM→BNK | 0.7 | 0.2515 | |
| | BNK→ARM | 0.8 | 11.2724 | | ARM→BNK | 0.8 | 0.0505 | |
| | BNK→ARM | 0.9 | 14.3820 | | ARM→BNK | 0.9 | 1.0194 | |
| | BNK→DLT | 0.1 | 12.7014 | *** | DLT→BNK | 0.1 | 2.8496 | |
| | BNK→DLT | 0.2 | 6.3581 | ** | DLT→BNK | 0.2 | 1.8818 | |
| | BNK→DLT | 0.3 | 3.0350 | | DLT→BNK | 0.3 | 2.0364 | |
| | BNK→DLT | 0.4 | 0.6822 | | DLT→BNK | 0.4 | 1.9986 | |
| (+) | BNK→DLT | 0.5 | 0.8334 | | DLT→BNK | 0.5 | 1.9404 | |
| | BNK→DLT | 0.6 | 3.5762 | | DLT→BNK | 0.6 | 4.5374 | |
| | BNK→DLT | 0.7 | 1.9967 | | DLT→BNK | 0.7 | 4.1687 | |
| | BNK→DLT | 0.8 | 1.6704 | | DLT→BNK | 0.8 | 8.0986 | ** |
| | BNK→DLT | 0.9 | 1.4603 | | DLT→BNK | 0.9 | 12.6834 | *** |
| | BNK→DZT | 0.1 | 11.9366 | ** | DZT→BNK | 0.1 | 29.6992 | *** |
| | BNK→DZT | 0.2 | 8.3465 | * | DZT→BNK | 0.2 | 29.4544 | *** |
| | BNK→DZT | 0.3 | 5.7920 | | DZT→BNK | 0.3 | 18.8677 | *** |
| | BNK→DZT | 0.4 | 5.7542 | | DZT→BNK | 0.4 | 12.5014 | * |
| (+) | BNK→DZT | 0.5 | 6.7282 | * | DZT→BNK | 0.5 | 9.6463 | * |
| | BNK→DZT | 0.6 | 5.8686 | * | DZT→BNK | 0.6 | 8.7574 | |
| | BNK→DZT | 0.7 | 7.5467 | ** | DZT→BNK | 0.7 | 8.9102 | |
| | BNK→DZT | 0.8 | 7.2551 | ** | DZT→BNK | 0.8 | 15.4611 | ** |
| | BNK→DZT | 0.9 | 6.4432 | | DZT→BNK | 0.9 | 10.0481 | |

Note: *, **, and *** show the significance at 10%, 5%, and 1% levels. (-) and (+) denote negative and positive effects, respectively.

**Table 5:** Fourier Quantile Granger Causality Test Results (Participation Banking)

| Causality | Quantile | Wald test. | | Effect | Causality | Quantile | Wald test. | |
|---|---|---|---|---|---|---|---|---|
| PRTB→ARM | 0.1 | 2.9869 | | | ARM→PRTB | 0.1 | 3.6291 | ** |
| PRTB→ARM | 0.2 | 0.3545 | | | ARM→PRTB | 0.2 | 1.5942 | * |
| PRTB→ARM | 0.3 | 0.6462 | | | ARM→PRTB | 0.3 | 0.8393 | |
| PRTB→ARM | 0.4 | 0.8471 | | | ARM→PRTB | 0.4 | 0.6433 | |
| PRTB→ARM | 0.5 | 1.3992 | | (+) | ARM→PRTB | 0.5 | 0.1874 | |
| PRTB→ARM | 0.6 | 1.3764 | | | ARM→PRTB | 0.6 | 0.1325 | |
| PRTB→ARM | 0.7 | 1.1624 | | | ARM→PRTB | 0.7 | 0.0110 | |
| PRTB→ARM | 0.8 | 2.7994 | | | ARM→PRTB | 0.8 | 0.3501 | |
| PRTB→ARM | 0.9 | 4.5559 | | | ARM→PRTB | 0.9 | 1.2580 | |
| PRTB→DLT | 0.1 | 2.2797 | | | DLT→PRTB | 0.1 | 13.5483 | *** |
| PRTB→DLT | 0.2 | 0.4207 | | | DLT→PRTB | 0.2 | 6.0796 | * |
| PRTB→DLT | 0.3 | 0.0266 | | | DLT→PRTB | 0.3 | 6.4098 | * |
| PRTB→DLT | 0.4 | 0.0846 | | | DLT→PRTB | 0.4 | 8.8568 | ** |
| PRTB→DLT | 0.5 | 0.6804 | | (+) | DLT→PRTB | 0.5 | 6.3653 | ** |
| PRTB→DLT | 0.6 | 0.8912 | | | DLT→PRTB | 0.6 | 6.2602 | *** |
| PRTB→DLT | 0.7 | 1.4207 | | | DLT→PRTB | 0.7 | 4.1746 | |
| PRTB→DLT | 0.8 | 1.1070 | | | DLT→PRTB | 0.8 | 4.0878 | |
| PRTB→DLT | 0.9 | 2.2152 | | | DLT→PRTB | 0.9 | 7.6850 | |
| PRTB→DZT | 0.1 | 7.1830 | | | DZT→PRTB | 0.1 | 16.7699 | ** |
| PRTB→DZT | 0.2 | 4.0368 | | | DZT→PRTB | 0.2 | 15.7433 | ** |
| PRTB→DZT | 0.3 | 3.9956 | | | DZT→PRTB | 0.3 | 12.5348 | * |
| PRTB→DZT | 0.4 | 4.0239 | | | DZT→PRTB | 0.4 | 8.9748 | * |
| PRTB→DZT | 0.5 | 2.6676 | | (+) | DZT→PRTB | 0.5 | 7.3315 | |
| PRTB→DZT | 0.6 | 2.9410 | | | DZT→PRTB | 0.6 | 7.8758 | |
| PRTB→DZT | 0.7 | 1.8664 | | | DZT→PRTB | 0.7 | 7.3694 | |
| PRTB→DZT | 0.8 | 1.7516 | | | DZT→PRTB | 0.8 | 10.9405 | ** |
| PRTB→DZT | 0.9 | 2.5893 | | | DZT→PRTB | 0.9 | 4.7697 | |

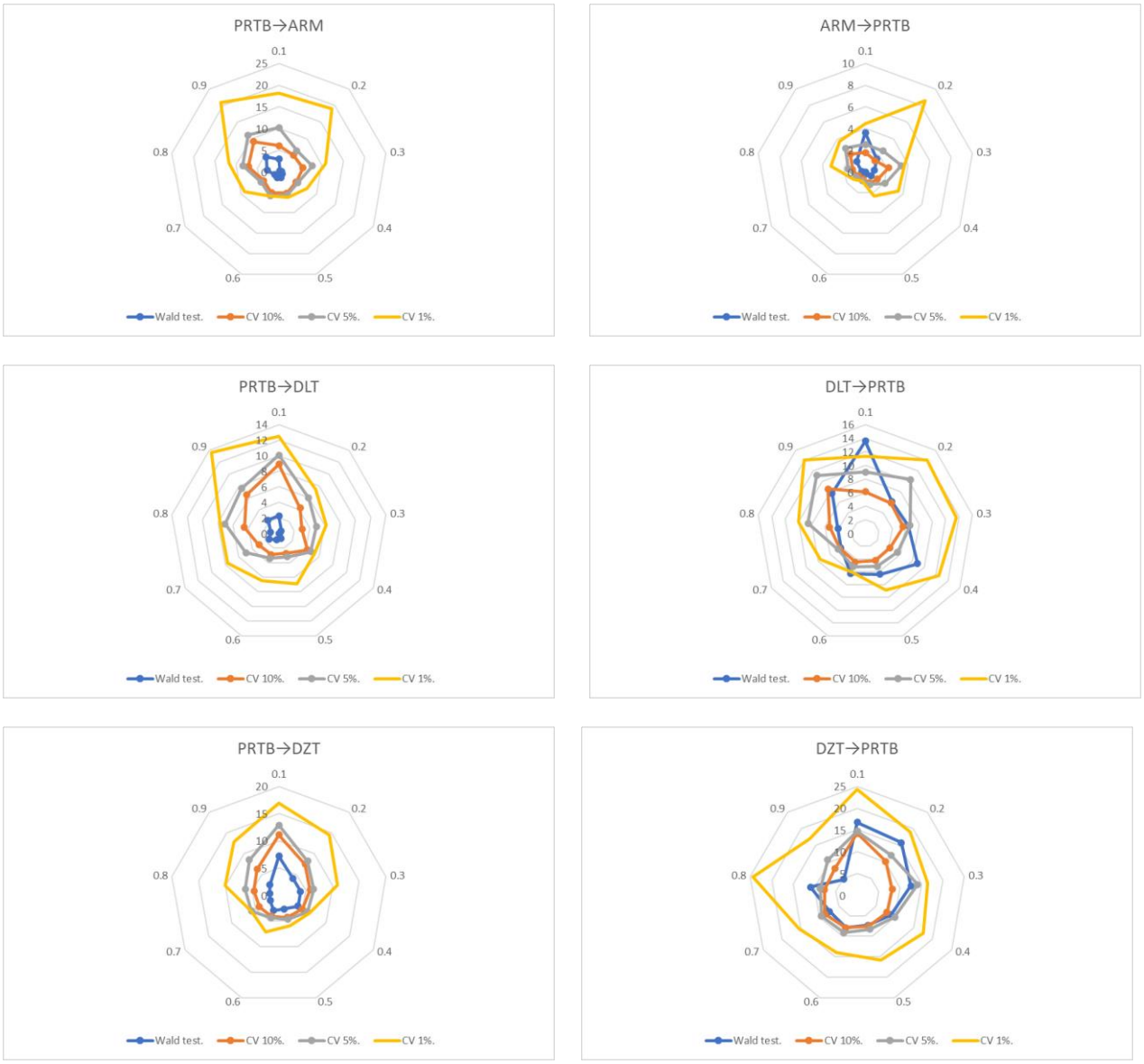
*Note: *, **, and *** show the significance at 10%, 5%, and 1% levels. (-) and (+) denote negative and positive effects, respectively.*

The causality relationships indicated in the table are also illustrated graphically in Figure 5 and Figure 6.

**Figure 5:** Fourier Quantile Granger Causality Test Graphic Display (Banking Sector)


Note: Confidence intervals are CV 10%, CV 5%, and CV 1%

**Figure 6:** Fourier Quantile Granger Causality Test Graphic Display (Participation Banking)




Note: Confidence intervals are CV 10%, CV 5%, and CV 1%

When evaluating the results in Table 4 and Figure 5, it can be observed that the banking sector influences the intermediate goods production sector (ARM), and there is a causality connection within the 0.1 and 0.3

quantiles. Looking at the sign of the coefficient of the independent variable, there is a positive causal relationship between the banking sector and the intermediate goods production sector. There is also a causality connection from the intermediate goods production sector to the banking sector within the 0.1 and 0.2 quantiles. The findings demonstrate that in the case of Turkiye, the development of the banking sector has a positive impact on the intermediate goods production sector. At the same time, the development of the intermediate goods production sector contributes positively to the development of the banking sector.

When evaluating the situation from the perspective of another variable, the Durable Consumer Goods Production Index (DLT), it can be observed that the banking sector also has an influence on the Durable Consumer Goods Production sector (DLT) within the ranges of 0.1 and 0.2, indicating a causal relationship. The positive sign of the coefficient of the independent variable also indicates a positive causal relationship between the Banking sector and the Durable Consumer Goods Production sector (DLT). Furthermore, there is a causal relationship between the ranges of 0.8 and 0.9 from the Durable Consumer Goods Production sector to the banking sector. The findings demonstrate that in the case of Turkiye, the development of the Banking sector has a positive impact on the Durable Consumer Goods Production sector. At the same time, the development of the Durable Consumer Goods Production sector also contributes positively to the development of the banking sector.

Similarly, when evaluating the situation from the perspective of another variable, the Non-Durable Consumer Goods Production Index (DZT), it can be observed that the banking sector also has an influence on the Non-Durable Consumer Goods Production sector (DZT) within the ranges of 0.1, 0.2, 0.5, 0.6, 0.7, and 0.8, indicating a causal relationship. The positive sign of the coefficient of the independent variable also indicates a positive causal relationship between the Banking sector and the Non-Durable Consumer Goods Production sector (DZT). Furthermore, a causal relationship exists between 0.1, 0.2, 0.3, 0.4, 0.5, and 0.8 from the Non-Durable Consumer Goods Production sector to the banking sector. The findings demonstrate that in the case of Turkiye, the development of the Banking sector has a positive impact on the Non-Durable Consumer Goods Production sector (DZT). At the same time, the development of the Non-Durable Consumer Goods Production sector contributes positively to the development of the banking sector.

The second group of evaluations analyzes the impact of Islamic Banking on the real sector. When evaluating the results of Table 5 and Figure 6 in this group, it can be seen that Islamic Banking does not affect the Intermediate Goods Production sector (ARM), and there is no causal relationship between Islamic Banking to the sector index in all ranges. However, there is a causal relationship within the ranges of 0.1 and 0.2 from the Intermediate Goods Production sector to Islamic Banking. Looking at the sign of the coefficient of the independent variable, there is a positive causal relationship between the Intermediate Goods Production sector to Islamic Banking. The findings demonstrate that in the case of Turkiye, Islamic Banking does not impact the development of the Intermediate Goods Production sector. Still, the Intermediate Goods Production sector's development contributes positively to Islamic Banking's development.

Similarly, when evaluating the situation from the perspective of another variable, the Durable Consumer Goods Production Index (DLT), it can be observed that Islamic Banking does not affect the Durable Consumer Goods Production Index (DLT), and there is no causal relationship from Islamic Banking to the sector index in all ranges. However, a causal relationship exists between 0.1, 0.2, 0.3, 0.4, 0.5, and 0.6 from the Durable Consumer Goods Production sector (DLT) to Islamic Banking. Looking at the sign of the coefficient of the independent variable, there is a positive causal relationship between the Durable Consumer Goods Production sector (DLT) to Islamic Banking. The findings demonstrate that, in the case of Turkiye, the development of the Islamic banking sector does not impact the Durable Consumer Goods Production sector. However, it shows that the growth of the Durable Consumer Goods Production sector positively contributes to the development of the Islamic banking sector.

When considering the variable of the Non-Durable Consumer Goods Production Index (DZT), it can be observed that Islamic Banking does not significantly influence the Non-Durable Consumer Goods Production Index (DZT). There is also no evident causal relationship between Islamic Banking to the sector index across all ranges. However, there is a causal relationship between the Non-Durable Consumer Goods Production sector (DZT) to Islamic Banking within the ranges of 0.1, 0.2, 0.3, 0.4, and 0.8. By examining the sign of the coefficient of the independent variable, a positive causal relationship between the Non-Durable Consumer Goods Production sector (DZT) to Islamic Banking becomes

apparent. These findings indicate that, in Turkiye's case, Islamic Banking's development does not significantly impact the Non-Durable Consumer Goods Production sector. Still, the Non-Durable Consumer Goods Production sector's growth positively contributes to Islamic Banking's development.

When these results are evaluated, it is seen that the banking sector operating in Turkiye contributes to the development of the real sector in line with the literature and at the same time the real sector serves the development of the banking sector. When the situation in terms of Islamic banking is evaluated, it is seen that the participation banking sector in Turkiye is still in the development stage and considering that its asset volume in the total banking sector is 8.34%, it is seen that the power to affect the real sector in the banking sector has not yet been formed. These results support the conclusions of the study prepared by the Finance Office of the Presidency of the Republic of Turkiye titled “2022-2025 Holistic Transformation: Participation Finance Strategy Document” prepared by the Finance Office of the Presidency of the Republic of Turkiye . In this study, the weaknesses of participation banking are discussed in detail. Some important points in the document can be briefly summarized as follows (TCFO, 2023):

1. Regulatory and Operational Challenges

- Inability to differentiate from conventional banking (subject to Banking Law No. 5411)
- Differentiation in jurisprudence and decisions based on necessity/maslahah
- Use of controversial products (tawarruq, etc.) in financial transactions
- Lack of effective and anecdotally acceptable liquidity mechanisms
- Lack of independent accounting standards

2. Economic and Financial Constraints

- Inability to benefit from economies of scale due to low scale size
- High liquidity risk and maturity mismatch
- Dividend rates linked to market interest rates and negative customer perception

- Negative impact of high volatility periods on dividend distribution mechanisms

3. Product and Service Development Issues

- Complexity and high transaction costs of products similar to conventional financial products
- Limited use of risk-sharing products (lack of regulation and incentives)
- Inability to provide adequate support to micro and small scale SMEs

4. Communication and Perception Management Deficiencies

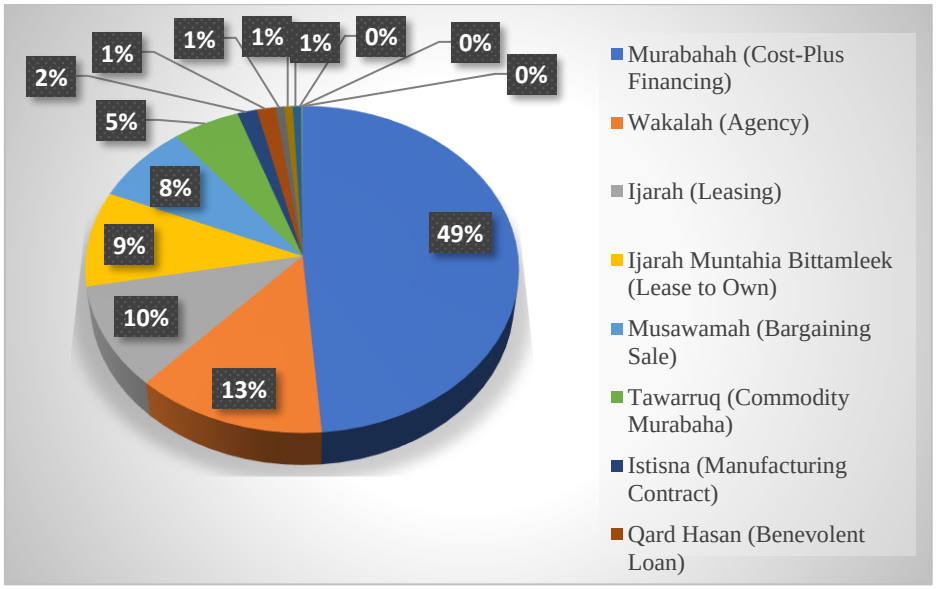
- Inadequate discourse on corporate values, risk-sharing, transparency and ethical principles other than the emphasis on interest-free
- Negative perception of jurisprudential decisions and controversial products
- Low level of financial literacy and knowledge among customers and staff

5. Research and Development Inadequacies

- Insufficiency of academic studies (oriented towards practice and problem solving)

The degree to which participation banks support the real economy depends on factors such as the transparency of their practices, the diversity of the products they offer (how much they include financial instruments other than murabahah, tawarruq, quard hasan) and how well they respond to customer needs (Eren et al., 2024). However, in the case of Turkiye, the distribution of funds allocated by participation banks is as follows:

**Figure 7:** Distribution of Funds Disbursed by Participation Banks in Turkiye (December 2023) (TKBB, 2024)




As can be seen in Figure 7, participation banks in Turkiye predominantly use instruments such as murabahah, tawarruq and leasing. This situation is insufficient to provide the performance expected from participation banks. The power of participation banks to support the real sector has the potential to be further strengthened through partnership-based financial instruments (Okka & Kazak, 2021; Kazak & Okka, 2022; Eren et al., 2024). Despite all these problems, the results of the empirical analysis reveal that the analyzed real sectors serve the growth of participation banking. Based on the literature, there is hope that the participation banking sector, which grows and develops with this support, will return to a mutual causality relationship in the long run and support the real sectors. This study did not reach a finding that supports the literature studies (Furqani & Mulyany, 2009; Rafay & Farid, 2017; Muttaqin, 2018; Setiawan, 2019; Chazi et al., 2020; Tekin, 2021; Hunjra et al., 2022; Kazak et al., 2023) that indicate that Islamic banking is effective on real sector growth. The study supports the studies on the Turkish sample (Yüksel & Canöz, 2017; Ergeç & Selçuk, 2020), which indicate that Islamic banking does not have a significant impact on the real sector. It is thought that this situation is due to the fact that participation banking is still in the development stage rather than being specific to the Turkish case.

## 6. Conclusion

The field of Islamic banking in Turkiye has shown development over the years, and its percentage within the entire banking sector has been growing yearly. The share of Islamic banking in the entire banking sector was 4.21% in 2010, but as of April 2023, this percentage has reached 8.34%. While the banking sector's average compound annual growth rate is 2.89%, Islamic banking stands at 8.44%. Undoubtedly, the positive support provided by the Turkish government towards "the growth of Islamic banking has played a significant role" in this progress. The existence of three state-owned participation banks in Turkiye (Emlak Katılım, Vakıf Katılım and Ziraat Katılım) can be cited as the most prominent evidence of this support. Despite this support and growth potential, Islamic banking represents a relatively small portion, accounting for only 8.34% of the total banking sector. Considering this situation, examining the comparative impact of the banking and Islamic banking sectors on the real sector will provide policymakers insightful findings.

The findings indicate that in the context of Turkiye, the banking sector contributes to the development of the real sector and vice versa, the growth in the real sector supports the development of the banking sector, as demonstrated by empirical evidence. In terms of Islamic banking, the power of the banking sector to influence the real sector has not yet been established. However, the result shows that the analyzed real sectors contribute to the growth of Islamic banking. There is a one-way causality from the relevant three-sector production indices toward the volume of Islamic banking credits which indicates that the Islamic banking sector requires support from the real sector in its initial stages of development. It can be predicted that the emerging Islamic banking sector will likely begin to positively impact industrial production volume, as exemplified in the literature, in future periods. However, this would require more time and research. It is believed that this study fills an important gap in the literature while also providing support for policy decisions regarding the development of the Islamic banking sector. The most important limitation of the study is that only three real sector indicators are taken into account and a relatively narrow time period is chosen since Islamic banking data is still new in Turkiye. In future studies, selecting a longer time period with other real sector indicators and new data will make the results of the study more meaningful. In addition, future studies will also provide important insights on how the field of Islamic finance has developed.

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